

PRELIMINARY DATA SUMMARY

November 1990

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Michael W. Leffler at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

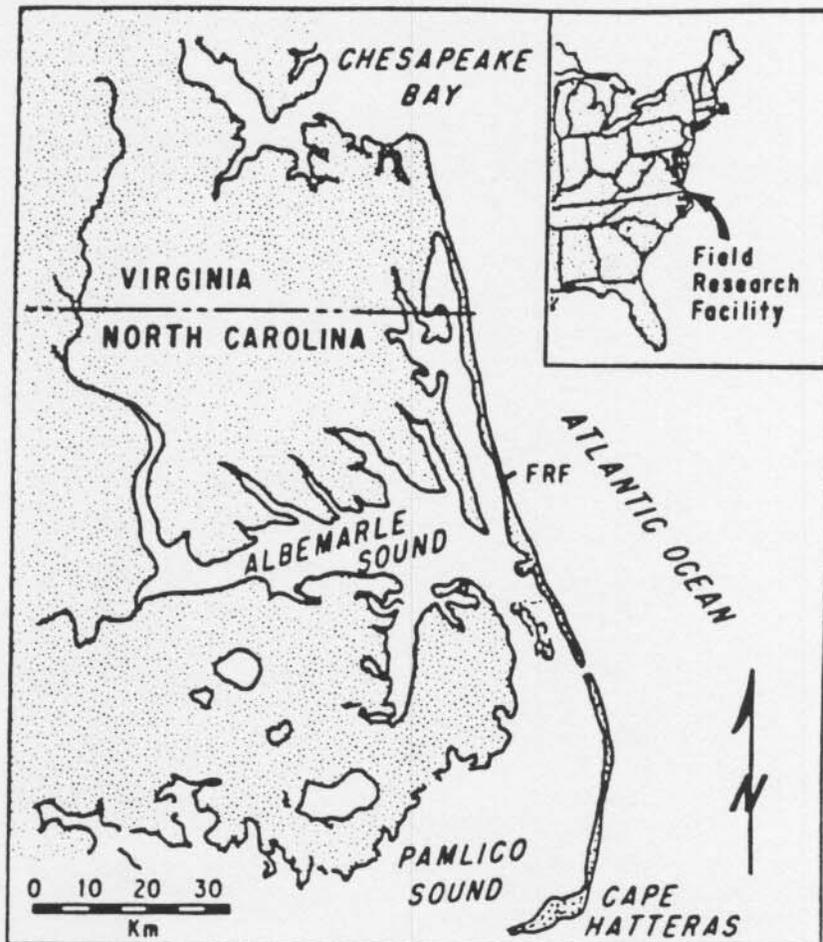


Figure 1. FRF location map

Table 1: Instrument Status/Data Availability

NOV 1990

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																					
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	2	2	2	2	2	2	2	3	0							
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Supplemental Observations (daily oceanographic and meteorological observations)			Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

Gage Status Daily Observation Analog Record Data Collected
 Operational = * Complete = * Complete = * All = *
 Partial = / Partial = / Partial = / Partial = /
 Non-Operational = - None = - None = - None = -

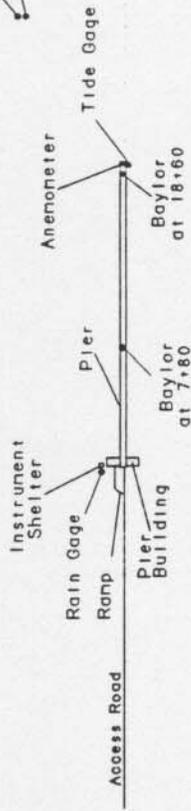
True North



Current Meter
320 m north of pier
Pressure Gage
309 m north of pier

Offshore
Waverider Buoy

Pier Building at 0+40 to 1+00
Anemometer at 0+70
12 Inch Rain Gage at 0+30
Instrument Shelter at 0+40



CURRITUCK SOUND

ATLANTIC OCEAN

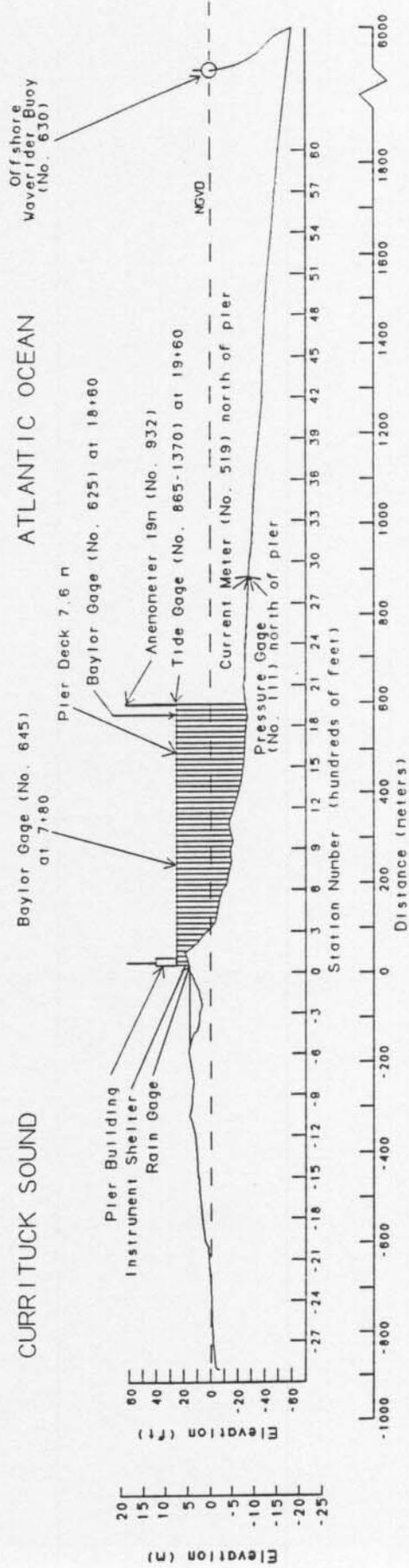


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $\text{mm} \times .03937 = \text{in.}$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $\text{mb} \times 0.02953 = \text{in. Hg}$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $\text{m/s} \times 1.943 = \text{kn}$

Table 2: Meteorological Data

Nov 1990						
Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	3	119	16.1	1021.3	0
	700	0		11.9	1021.9	0
	1300	2	86	20.8	1022.3	0
	1900	4	139	17.5	1022.6	0
2	100	2	174	13.2	1022.6	0
	700	1	276	14.1	1023.6	0
	1300	3	230	22.9	1023.3	0
	1900	5	193	18.1	1023.0	0
3	100	4	221	15.9	1022.6	0
	700	3	243	15.1	1023.0	0
	1300	5	250	22.4	1020.9	0
	1900	5	212	17.8	1019.6	0
4	100	3	225	15.8	1019.6	0
	700	3	235	15.4	1018.6	0
	1300	4	252	21.3	1016.5	0
	1900	3	208	16.6	1014.8	0
5	100	3	239	16.5	1013.8	0
	700	2	256	15.8	1012.5	0
	1300	4	155	20.2	1009.4	0
	1900	8	175	18.3	1006.0	0
6	100	5	254	19.2	1004.0	0
	700	7	300	14.7	1007.4	3
	1300	6	13	17.5	1012.1	0
	1900	7	26	16.2	1014.8	0
7	100	9	39	15.2	1015.9	0
	700	4	52	14.0	1018.2	0
	1300	2	78	17.0	1015.9	0
	1900	3	159	14.3	1014.2	0
8	100	5	302	13.2	1014.2	0
	700	14	358	10.8	1017.9	0
	1300	11	6	10.9	1020.3	0
	1900	9	22	10.0	1022.3	0
9	100	5	56	10.5	1023.3	0
	700	4	59	11.9	1023.3	0
	1300	7	80	14.4	1019.2	0
	1900	7	140	16.1	1015.2	0
10	100	12	124	18.4	1007.4	0
	700	11	183	20.2	997.2	32
	1300	7	260	20.3	994.5	2
	1900	10	295	13.6	1001.3	0
11	100	11	293	10.4	1008.1	0
	700	11	286	8.2	1014.2	0
	1300	8	289	14.0	1016.9	0
	1900	8	253	13.0	1016.5	0
12	100	10	232	11.7	1014.2	0
	700	6	307	10.9	1016.9	0
	1300	4	23	13.8	1016.2	0
	1900	3	141	10.5	1015.5	0
13	100	11	16	11.1	1016.2	0
	700	7	315	7.5	1018.6	0
	1300	6	322	9.1	1020.3	0
	1900	5	323	8.3	1022.3	0
14	100	6	317	6.6	1024.0	0
	700	11	350	7.9	1026.7	0
	1300	6	354	9.9	1028.0	0
	1900	3	36	9.5	1029.4	0
15	100	3	248	6.6	1029.7	0
	700	4	247	8.2	1029.7	0
	1300	3	229	14.4	1028.0	0
	1900	4	202	11.1	1026.0	0
16	100	6	231	10.4	1024.0	0
	700	4	226	10.0	1023.3	0
	1300	5	204	16.7	1018.6	0
	1900	7	196	13.3	1015.9	0

* electronic problems

(Continued)

Table 2: Meteorological Data

Nov 1990

Day	Hour	Wind Speed	Wind Direction	Temperature	Atm Pressure	Precipitation
		m/sec	deg TN	deg C	mb	mm
17	100	7	235	12.9	1012.1	0
	700	5	241	11.8	1009.4	0
	1300	12	314	10.3	1010.4	0
	1900	11	319	9.8	1012.1	0
18	100	18	359	9.0	1012.5	0
	700	13	340	5.6	1014.2	0
	1300	14	345	9.1	1014.5	0
	1900	10	338	6.8	1015.2	0
19	100	7	329	4.9	1014.5	0
	700	7	318	2.8	1016.2	0
	1300	4	333	10.5	1015.5	0
	1900	3	284	7.4	1015.9	0
20	100	4	280	6.5	1016.5	0
	700	1	325	5.0	1018.9	0
	1300	7	7	12.9	1019.9	0
	1900	7	352	10.0	1021.3	0
21	100	10	21	11.1	1021.6	0
	700	7	8	9.2	1023.0	0
	1300	6	9	11.4	1023.0	0
	1900	1	339	7.2	1023.0	0
22	100	1	256	4.5	1021.3	0
	700	3	289	6.3	1020.9	0
	1300	3	155	14.1	1018.6	0
	1900	5	185	10.7	1015.9	0
23	100	6	210	11.2	1012.5	0
	700	5	224	11.9	1009.1	0
	1300	7	230	13.6	1005.7	0
	1900	6	199	12.9	1004.0	0
24	100	9	241	12.7	1003.3	0
	700	6	262	10.9	1008.4	0
	1300	7	236	13.3	1009.8	0
	1900	6	193	12.1	1012.5	0
25	100	7	214	12.1	1012.5	0
	700	8	223	15.0	1013.8	0
	1300	6	235	16.5	1012.5	0
	1900	5	227	13.1	1015.2	0
26	100	6	210	12.4	1016.2	0
	700	5	220	10.8	1018.9	0
	1300	4	201	19.6	1019.6	0
	1900	8	194	14.7	1020.3	0
27	100	5	221	12.1	1021.9	0
	700	5	211	11.8	1023.0	0
	1300	4	177	18.8	1022.3	0
	1900	5	201	15.6	1021.9	0
28	100	6	193	15.9	1021.3	0
	700	7	185	18.2	1021.3	0
	1300	10	195	23.8	1019.2	0
	1900	8	187	20.3	1019.2	0
29	100	6	197	18.5	1017.9	0
	700	7	201	19.3	1016.2	0
	1300	14	358	11.3	1016.9	9
	1900	13	326	8.0	1019.9	5
30	100	17	328	5.4	1024.0	0
	700	13	324	4.5	1027.4	0
	1300	10	347	7.3	1029.1	0
	1900	4	321	3.6	1030.4	0
		<u>Resultant</u>		<u>Mean</u>	<u>Mean</u>	<u>Total</u>
		2	283	12.8	1017.4	51

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hr (more frequently during storms) beginning at 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for four contiguous 34-min records.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Nov 1990

Day	Hour	645 Baylor at 7+80		625 Baylor at 18+60		111 Pressure Gage		630 Offshr Wvrdr	
		Hmo.m	T.sec	Hmo.m	T.sec	Hmo.m	T.sec	Hmo.m	T.sec
1	0100	0.37	10.24	0.59	9.48	0.69	9.85	0.64	10.24
	0700	0.37	10.67	0.54	9.85	0.58	10.24	0.55	10.67
	1300	0.38	11.64	0.58	11.13	0.54	10.67	0.65	11.13
	1900	0.38	9.48	0.51	10.24	0.57	9.85	0.61	10.67
2	0100	0.40	10.24	0.50	10.67	0.53	10.24	0.53	10.24
	0700	0.25	10.24	0.39	9.85	0.41	9.85	0.45	10.67
	1300	0.26	8.83	0.39	8.53	0.41	8.83	0.50	9.14
	1900	0.26	8.26	0.39	8.26	0.46	8.00	0.49	8.53
3	0100	0.26	14.22	0.36	7.53	0.38	8.26	0.47	8.00
	0700	0.19	13.47	0.32	14.22	0.36	8.53	0.42	8.53
	1300	0.20	14.22	0.31	8.83	0.34	13.47	0.40	13.47
	1900	0.25	12.19	0.36	13.47	0.42	13.47	0.40	12.80
4	0100	0.23	15.06	0.34	12.19	0.38	9.14	0.47	9.14
	0700	0.30	8.83	0.44	8.83	0.50	9.48	0.55	8.83
	1300	0.32	8.26	0.44	8.53	0.51	9.48	0.59	9.85
	1900	0.40	10.24	0.54	9.85	0.56	8.83	0.68	8.53
5	0100	0.36	9.85	0.51	9.85	0.60	9.85	0.64	9.48
	0700	0.53	10.24	0.76	10.24	0.82	10.67	0.95	10.24
	1300	0.67	10.67	0.72	9.85	1.00	9.85	1.10	10.24
	1900	0.61	10.24	0.79	10.24	0.96	10.24	0.96	8.53
6	0100	0.57	9.85	0.73	9.85	0.92	9.85	1.06	8.83
	0700	0.67	8.53	0.86	8.83	0.91	8.26	1.21	8.83
	1300	0.66	4.66	0.77	9.14	0.77	9.48	0.93	10.24
	1900	0.91	4.83	0.89	9.14	1.01	8.83	1.06	9.14
7	0100	0.98	5.45	1.14	5.22	1.23	5.33	1.29	5.45
	0700	1.02	5.82	0.95	5.45	1.06	5.82	1.27	5.82
	1300	0.89	5.69	0.80	6.09	0.90	6.24	0.93	6.24
	1900	0.62	5.69	0.69	8.00	0.72	8.26	0.76	5.95
8	0100	0.53	5.22	0.53	7.53	0.58	7.76	0.71	7.76
	0700	1.15	6.74	1.68	6.09	1.92	5.95	2.08	6.40
	1300	1.32	7.11	1.78	7.31	1.93	7.31	2.09	7.53
	1900	0.98	5.69	1.17	7.11	1.27	6.09	1.53	6.09
9	0100	1.11	7.31	1.05	7.11	1.13	6.56	1.22	7.53
	0700	0.84	5.95	0.89	6.56	0.87	4.66	0.95	6.74
	1300	0.84	5.69	0.89	4.00	0.91	4.27	1.12	6.09
	1900	0.88	5.57	0.93	4.57	1.06	5.33	1.08	4.66
10	0100	1.11	5.95	1.73	6.40	1.75	6.56	1.99	6.24
	0700	1.19	11.13	2.54	9.48	3.06	9.85	3.56	9.48
	1300	1.22	9.48	1.43	9.85	1.67	9.14	1.86	9.48
	1900	0.74	10.67	1.11	10.67	1.19	10.24	1.53	10.67
11	0100	0.96	3.94	1.06	10.67	1.20	11.13	1.46	10.67
	0700	0.75	3.82	0.93	10.24	0.97	10.24	1.21	9.48
	1300	0.66	9.85	0.76	9.85	0.87	6.24	1.01	4.27
	1900	0.37	9.48	0.55	9.48	0.60	9.48	0.72	10.67
12	0100	0.19	9.14	0.30	8.83	0.32	9.14	0.61	2.56
	0700	0.12	14.22	0.24	11.13	0.27	11.64	0.45	2.98
	1300	0.37	4.06	0.46	4.66	0.44	3.82	0.57	6.92
	1900	0.43	5.69	0.68	6.56	0.72	5.82	0.86	6.74
13	0100	0.84	3.37	1.10	8.00	1.03	8.26	1.18	8.00
	0700	1.06	6.24	1.18	6.74	1.26	7.31	1.35	6.56
	1300	0.97	3.28	1.17	7.11	1.26	7.53	1.35	6.40
	1900	0.98	6.74	1.03	7.31	1.22	6.74	1.36	7.53
14	0100	1.00	6.24	1.37	8.00	1.38	6.40	1.58	6.40
	0700	1.23	7.11	1.61	7.11	1.74	7.53	1.82	7.11
	1300	0.87	6.74	1.37	7.31	1.54	6.74	1.71	8.83
	1900	0.97	5.57	0.92	9.14	1.06	8.83	1.30	8.83
15	0100	0.63	5.12	0.79	7.53	0.79	6.92	0.96	7.31
	0700	0.44	6.09	0.52	5.95	0.64	6.56	0.65	6.40
	1300	0.27	4.92	0.49	9.14	0.51	9.14	0.55	6.74
	1900	0.22	8.53	0.40	8.53	0.40	6.40	0.47	8.26
16	0100	0.16	18.29	0.31	8.00	0.35	8.00	0.43	7.53
	0700	0.15	8.26	0.24	8.00	0.27	8.83	0.33	7.76
	1300	0.14	8.83	0.23	9.48	0.25	7.11	0.31	8.26
	1900	0.23	3.08	0.29	2.98	0.24	7.76	0.44	2.78

* Electronic problems

(Continued)

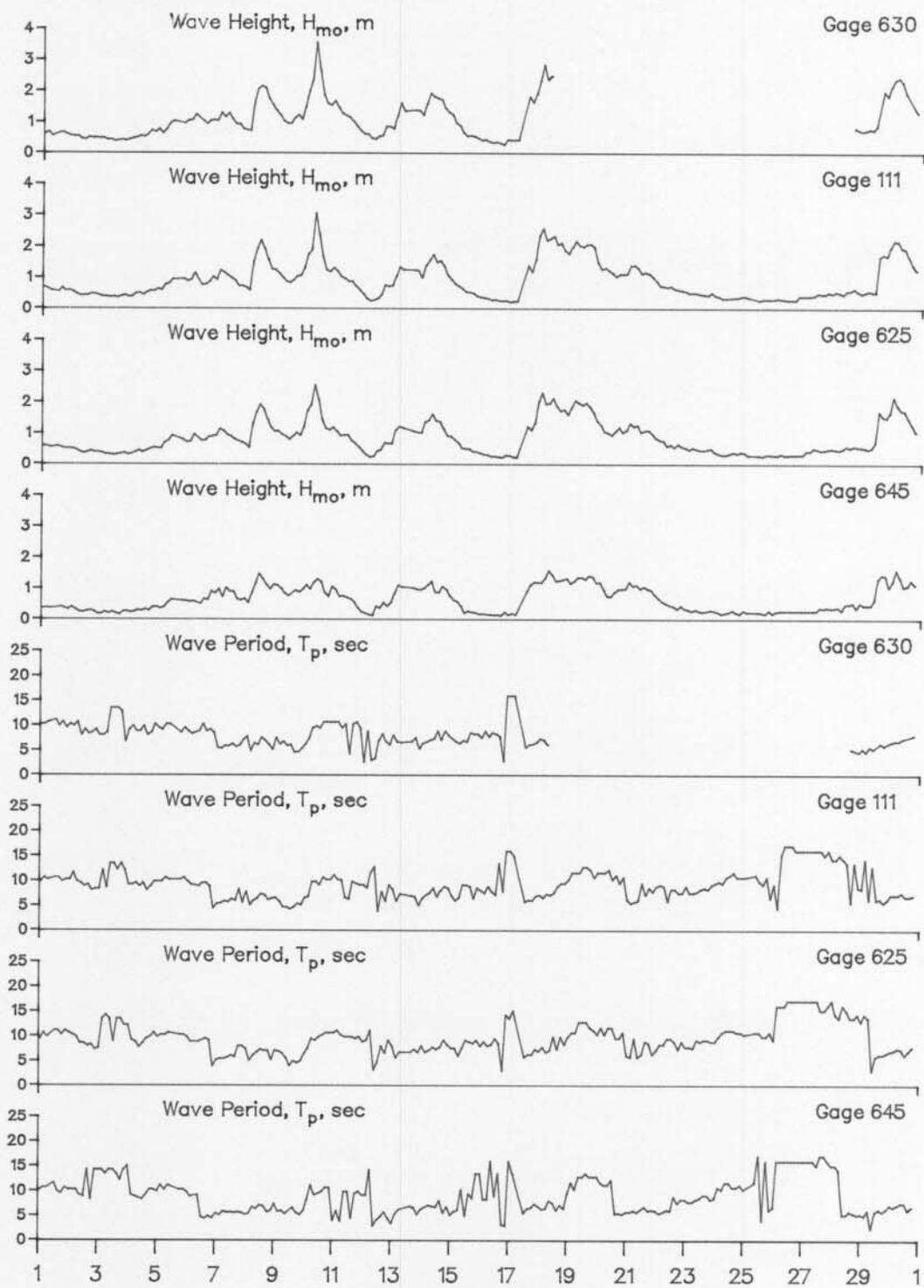
Table 3: Wave Data

Nov 1990

Day	Hour	645		625		111		630	
		Baylor at 7+80		Baylor at 18+60		Pressure Gage		Offshre Wvrdr	
		Hmo.m	T.sec	Hmo.m	T.sec	Hmo.m	T.sec	Hmo.m	T.sec
17	0100	0.18	16.00	0.23	13.47	0.22	16.00	0.37	8.83
	0700	0.14	17.01	0.21	16.00	0.21	9.14	0.35	8.83
	1300	0.89	5.45	1.23	5.69	1.39	5.69	1.82	5.57
	1900	1.21	6.56	1.34	6.24	1.57	5.95	1.90	6.24
18	0100	1.20	6.92	2.29	6.92	2.57	7.11	2.84	7.31
	0700	1.59	6.40	1.96	6.74	2.24	7.31	2.48	6.09
	1300	1.24	7.53	1.87	9.85	2.07	7.53		
	1900	1.29	7.11	1.76	9.85	1.88	9.48		
19	0100	1.17	9.48	1.83	9.85	1.97	10.24		
	0700	1.36	10.24	1.98	10.67	2.04	11.64		
	1300	1.30	12.80	1.97	12.80	2.07	12.80		
	1900	1.39	12.80	1.67	11.64	1.98	12.19		
20	0100	1.20	12.80	1.26	10.24	1.26	11.64		
	0700	0.75	11.13	1.01	10.24	1.22	11.64		
	1300	0.88	12.19	1.06	11.64	1.04	10.24		
	1900	0.98	5.45	1.03	9.48	1.10	9.48		
21	0100	1.22	5.69	1.32	5.95	1.39	6.09		
	0700	1.11	5.95	1.26	9.48	1.31	5.69		
	1300	1.05	6.24	1.09	6.24	1.16	9.48		
	1900	0.94	5.95	0.98	8.53	1.02	8.53		
22	0100	0.68	5.95	0.78	7.11	0.74	8.83		
	0700	0.51	5.69	0.59	8.26	0.68	8.83		
	1300	0.42	5.95	0.55	9.48	0.62	8.26		
	1900	0.43	7.53	0.56	7.31	0.57	7.53		
23	0100	0.31	8.26	0.47	7.76	0.49	8.83	Gage Inoperative	
	0700	0.31	7.76	0.48	7.53	0.49	7.53		
	1300	0.24	8.53	0.44	8.83	0.44	8.26		
	1900	0.29	9.14	0.49	9.14	0.50	8.26		
24	0100	0.24	8.53	0.34	8.83	0.38	9.48		
	0700	0.20	10.24	0.30	10.67	0.32	9.48		
	1300	0.29	11.64	0.38	11.13	0.34	11.13		
	1900	0.18	10.67	0.38	10.67	0.38	10.67		
25	0100	0.24	10.24	0.28	10.24	0.35	10.67		
	0700	0.22	11.64	0.27	10.67	0.26	11.13		
	1300	0.21	17.07	0.25	10.67	0.28	9.85		
	1900	0.28	16.00	0.30	9.85	0.28	10.67		
26	0100	0.26	6.56	0.28	9.14	0.31	9.14		
	0700	0.26	19.69	0.29	16.00	0.28	15.06		
	1300	0.25	18.29	0.29	17.07	0.31	18.29		
	1900	0.45	18.29	0.46	18.29	0.40	16.00		
27	0100	0.34	18.29	0.41	17.07	0.43	18.29		
	0700	0.27	18.29	0.51	17.07	0.41	16.00		
	1300	0.37	15.06	0.44	17.07	0.46	16.00		
	1900	0.38	17.07	0.48	15.06	0.51	15.06		
28	0100	0.37	15.06	0.47	17.07	0.53	14.22		
	0700	0.30	14.22	0.49	13.47	0.45	15.06		
	1300	0.50	5.12	0.53	15.06	0.57	13.47		
	1900	0.37	5.45	0.56	13.47	0.54	13.47	0.74	4.92
29	0100	0.46	5.22	0.52	12.80	0.51	8.26	0.73	5.33
	0700	0.46	5.95	0.53	13.47	0.53	6.09	0.75	5.69
	1300	1.31	5.82	1.69	5.82	1.67	6.09	2.04	6.10
	1900	1.42	5.82	1.49	6.24	1.70	5.57	1.84	5.95
30	0100	1.22	7.11	2.15	6.92	2.19	7.11	2.37	6.74
	0700	1.36	7.11	1.74	7.53	1.96	7.11	2.29	6.92
	1300	1.08	7.53	1.47	6.09	1.65	6.74	1.83	7.76
	1900	1.12	6.74	1.04	7.76	1.24	6.92	1.30	8.00
Mean		0.65	9.03	0.84	9.45	0.91	9.19	1.10	7.81
Std dev		0.40	3.92	0.53	3.03	0.59	2.88	0.66	2.11

* Electronic problems

(Sheet 2 of 2)



NOVEMBER
1990

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data
Nov 1990

Day	Time	Pier Measurements					Beach Measurements			Current Meter	
		Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)	Dye 12m offshore (surface)		500m Updrift		0.9 km Offshore Depth -5.6m (NGVD) ID #519		
	Resultant	Speed	Dir	Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Speed	Dir
1	0100	Along								2	N
		Cross								4	on
		Result								4	277
1	0700	Along	22	S		21	S			1	S
		Cross	0		152	6	off	North	3	4	on
		Result	22	160		22	143			4	236
1	1300	Along								7	N
		Cross								2	on
		Result								7	324
1	1900	Along								9	N
		Cross								2	off
		Result								9	353
2	0100	Along								15	N
		Cross								1	off
		Result								15	344
2	0700	Along	12	N		3	S			14	N
		Cross	3	off	140	3	off	North	2	0	
		Result	13	354		4	109			14	340
2	1300	Along								13	N
		Cross								1	on
		Result								13	336
2	1900	Along								9	N
		Cross								3	on
		Result								9	322
3	0100	Along								11	N
		Cross								2	on
		Result								11	330
3	0700	Along	6	N		3	N			15	N
		Cross	9	off	165	6	off	South	13	0	
		Result	11	36		7	43			15	340
3	1300	Along								14	N
		Cross								0	
		Result								14	340
3	1900	Along								8	N
		Cross								1	off
		Result								8	347
4	0100	Along								8	N
		Cross								4	on
		Result								9	313
4	0700	Along	3	S		5	N			11	N
		Cross	6	off	165	9	off	South	4	0	
		Result	7	92		10	40			11	340
4	1300	Along								6	N
		Cross								3	on
		Result								7	313
4	1900	Along								5	N
		Cross								1	on
		Result								5	329
5	0100	Along								2	S
		Cross								10	on
		Result								10	239
5	0700	Along	20	N		10	N			13	N
		Cross	10	on	152	0		South	10	1	off
		Result	23	313		10	340			13	344
5	1300	Along								13	N
		Cross								7	on
		Result								15	312
5	1900	Along								17	N
		Cross								3	on
		Result								17	330

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Nov 1990

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface) Location	Speed	Dir	Speed
6	0100	-Along Cross Result								10	N
										4	on
										11	318
6	0700	-Along Cross Result	14 0 14	S	152	8 2 8	S off	North	13	15 2 15	N off 348
6	1300	-Along Cross Result								3 5 6	S on 219
6	1900	-Along Cross Result								9 9 13	S on 205
7	0100	-Along Cross Result								10 13 16	S on 212
7	0700	-Along Cross Result	2 2 3	N on	152	18 5 19	S off	North	22	4 8 9	N on 277
7	1300	-Along Cross Result								0 6 6	 on 250
7	1900	-Along Cross Result								76 4 76	N on 337
8	0100	-Along Cross Result								75 8 75	N on 334
8	0700	-Along Cross Result	76 0 76	S	165	102 15 103	S on	North	104	85 4 85	N on 337
8	1300	-Along Cross Result									
8	1900	-Along Cross Result									
9	0100	-Along Cross Result									
9	0700	-Along Cross Result	19 8 21	S on	165	23 0 23	S	North	14		
9	1300	-Along Cross Result								17 59 61	N off 54
9	1900	-Along Cross Result								13 63 64	N off 58
10	0100	-Along Cross Result								11 41 42	N off 55
10	0700	-Along Cross Result	38 10 39	N off	152	102 0 102	N	South	99	7 5 9	N off 16
10	1300	-Along Cross Result								6 9 11	N on 284
10	1900	-Along Cross Result								11 2 11	S off 150

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Nov 1990

Day	Time	Alongshore Cross-shore Resultant	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519		
			Dye at (579 m) (surface) Speed	Dir	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Speed	Dir
11	0100	-Along Cross Result									17 5 18	S off 144
11	0700	-Along Cross Result	27 0 27	S 160	152	23 6 24	S off 146	North	25	S	18 5 19	S off 144
11	1300	-Along Cross Result									12 7 14	S off 130
11	1900	-Along Cross Result									2 1 2	S on 187
12	0100	-Along Cross Result									28 11 30	N on 319
12	0700	-Along Cross Result	4 0 4	S 160	152	9 0 9	S 160	North	13	S	10 4 11	N on 318
12	1300	-Along Cross Result									12 3 12	N on 326
12	1900	-Along Cross Result									13 4 14	N on 323
13	0100	-Along Cross Result									11 1 11	N on 335
13	0700	-Along Cross Result	16 8 17	S off 133	177	23 0 23	S 160	North	45	S	9 3 9	S off 142
13	1300	-Along Cross Result										
13	1900	-Along Cross Result									6 3 7	S off 133
14	0100	-Along Cross Result									2 2 3	N on 295
14	0700	-Along Cross Result	24 0 24	S 160	177	51 0 51	S 160	North	28	S	17 7 18	S off 138
14	1300	-Along Cross Result									20 7 21	S off 141
14	1900	-Along Cross Result									35 13 37	S off 140
15	0100	-Along Cross Result									27 9 28	S off 142
15	0700	-Along Cross Result	24 0 24	S 160	165	3 6 7	S off 100	North	10	S	29 13 32	S off 136
15	1300	-Along Cross Result									15 0 15	S 160
15	1900	-Along Cross Result									4 2 4	S off 133

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Continued)
Nov 1990

Day	Time	Pier Measurements					Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
		Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface) Distance from Baseline		Speed	Dir	Location	Speed	Dir	Speed
Resultant	Speed	Dir	(m)	Speed	Dir						
16	0100	Along Cross								9	N
		Result								4	on
16	0700	Along	18	N		7	N			10	316
		Cross	4	off	140	3	off	South	15	8	N
		Result	18	354		7	7			6	on
16	1300	Along								10	N
		Cross								6	on
		Result								12	309
16	1900	Along								6	N
		Cross								6	on
		Result								8	295
17	0100	Along								10	N
		Cross								5	on
		Result								11	313
17	0700	Along	44	S		23	S			12	S
		Cross	11	off	165	12	off	North	49	16	off
		Result	45	146		26	133			20	107
17	1300	Along								23	S
		Cross								7	off
		Result								24	143
17	1900	Along								31	S
		Cross								9	off
		Result								32	144
18	0100	Along								58	S
		Cross								20	off
		Result								61	141
18	0700	Along	76	S		102	S			58	S
		Cross	0		165	0		North	81	17	off
		Result	76	160		102	160			60	144
18	1300	Along								54	S
		Cross								15	off
		Result								56	144
18	1900	Along								37	S
		Cross								8	off
		Result								38	148
19	0100	Along								31	S
		Cross								10	off
		Result								33	142
19	0700	Along	29	S		44	S			24	S
		Cross	29	off	152	0		North	51	10	off
		Result	41	115		44	160			26	137
19	1300	Along								25	S
		Cross								11	off
		Result								27	136
19	1900	Along								14	S
		Cross								3	off
		Result								14	148
20	0100	Along								18	S
		Cross								5	off
		Result								19	144
20	0700	Along	16	S		18	S			7	S
		Cross	2	off	165	9	off	North	31	7	off
		Result	16	151		21	133			10	115
20	1300	Along								17	S
		Cross								7	off
		Result								18	138
20	1900	Along								15	S
		Cross								5	off
		Result								16	142

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
 S = Southward, Shore parallel
 on = onshore off = offshore

Table 4: Current Data (Continued)
Nov 1990

Day	Time	Pier Measurements					Beach Measurements (500m Updrift)			Current Meter 0.9 km Offshore Depth -5.6m (NGVD) ID #519	
		Alongshore Cross-shore Resultant	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface) Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Speed	Dir	Speed	Dir
21	0100	Along Cross Result								14 6 15	S off 137
21	0700	Along Cross Result	18 0 18	S 160	152	38 0 38	S 160	North	25	10 4 11	S off 138
21	1300	Along Cross Result								16 9 18	S off 131
21	1900	Along Cross Result								9 3 9	S on 178
22	0100	Along Cross Result								3 2 4	S on 194
22	0700	Along Cross Result	9 9 13	N off 25	116	0 4 4		South	4	4 0 4	N N 340
22	1300	Along Cross Result								1 0 1	S 160
22	1900	Along Cross Result								4 4 6	S on 205
23	0100	Along Cross Result								0 5 5	 on 250
23	0700	Along Cross Result	18 18 26	N off 25	116	22 22 31	N off 25	South	7	11 7 13	N on 308
23	1300	Along Cross Result								10 6 12	N on 309
23	1900	Along Cross Result								9 8 12	N on 298
24	0100	Along Cross Result								7 4 8	N on 310
24	0700	Along Cross Result	10 21 23	S off 94	116	15 9 17	S off 129	North	11	7 3 8	N on 317
24	1300	Along Cross Result								7 4 8	N on 310
24	1900	Along Cross Result								11 5 12	N on 316
25	0100	Along Cross Result								11 5 12	N on 316
25	0700	Along Cross Result	24 7 25	N off 357	128	9 5 10	N off 11	South	6	20 9 22	N on 316
25	1300	Along Cross Result								17 6 18	N on 321
25	1900	Along Cross Result								10 6 12	N on 309

KEY = All speeds in cm/sec
N = Northward, Shore parallel
S = Southward, Shore parallel
on = onshore off = offshore

Table 4: Current Data (Concluded)
Nov 1990

Day	Time	Pier Measurements					Beach Measurements			Current Meter	
		Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)		(500m Updrift)			0.9 km Offshore		
		Speed	Dir	Distance from Baseline (m)	Speed	Dir	Location	Speed	Dir	Depth -5.6m (NGVD) ID #519	
26	0100								7	N	
	Along Cross Result								6	on	
									9	299	
26	0700	14	N		3	N		6	9	N	
	Along Cross Result	11	off	140	6	off	South	6	6	on	
		18	17		7	43		11	11	306	
26	1300								11	N	
	Along Cross Result								7	on	
									13	308	
26	1900								5	N	
	Along Cross Result								4	on	
									6	301	
27	0100								5	N	
	Along Cross Result								2	on	
									5	318	
27	0700	8	N		6	N		5	1	N	
	Along Cross Result	8	off	165	7	off	South	1	1	on	
		11	25		9	30		1	1	295	
27	1300								8	N	
	Along Cross Result								4	on	
									9	313	
27	1900								5	N	
	Along Cross Result								3	on	
									6	309	
28	0100								12	N	
	Along Cross Result								6	on	
									13	313	
28	0700	23	N		21	N		38	1	N	
	Along Cross Result	0		165	0		South	3	3	on	
		23	340		21	340		3	3	268	
28	1300								11	N	
	Along Cross Result								9	on	
									14	301	
28	1900								14	N	
	Along Cross Result								6	on	
									15	317	
29	0100								17	N	
	Along Cross Result								7	on	
									18	318	
29	0700	15	N		17	N		20	8	N	
	Along Cross Result	9	off	165	7	off	South	6	6	on	
		18	11		18	2		10	10	303	
29	1300								27	S	
	Along Cross Result								8	off	
									28	143	
29	1900								41	S	
	Along Cross Result								14	off	
									43	141	
30	0100								48	S	
	Along Cross Result								13	off	
									50	145	
30	0700	51	S		102	S		8	47	S	
	Along Cross Result	0		189	0		North	14	14	off	
		51	160		102	160		49	49	143	
30	1300								29	S	
	Along Cross Result								8	off	
									30	145	
30	1900								24	S	
	Along Cross Result								9	off	
									26	139	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
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 on = onshore off = offshore

PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Nov 1990

Day	Time	Wave Approach Angle at Pier End deg from True N		Radar Wave Angle deg from True N	Width of Surf Zone.m	Water Characteristics at Pier End		
		Primary	Secondary			Temp..C	Density g/cc	Secchi Vis..m
1	0840	55		inoperative	102	17.2	1.0214	3.0
2	0900	55	95	inoperative	6	17.2	1.0216	3.0
3	1146	100		inoperative	111	18.3	1.0225	2.4
4	1130	105		inoperative	131	18.9	1.0228	1.8
5	0820	95		inoperative	104	18.9	1.0229	2.4
6	0845	95		inoperative	107	18.9	1.0232	1.5
7	0820	30	100	inoperative	108	18.3	1.0231	2.1
8	0900	25		inoperative	195	17.2	1.0230	0.6
9	0912	35	90	inoperative	102	15.6	1.0121	3.0
10	1140	95		inoperative	192	16.7	1.0222	1.8
11	1210	30	80	inoperative	136	16.7	1.0227	1.8
12	0855	35		inoperative	12	16.1	1.0230	1.8
13	0846	40		inoperative	140	15.6	1.0229	1.5
14	0855	50		inoperative	152	14.7	1.0230	0.3
15	0856	40	105	inoperative	117	13.9	1.0205	2.7
16	0900	90	25	inoperative	11	15.0	1.0220	2.1
17	1200	25		inoperative	146	16.1	1.0235	0.9
18	1218	25		inoperative	317	14.2	1.0232	0.6
19	0920	50		inoperative	226	13.3	1.0226	0.6
20	0840	60		inoperative	128	13.3	1.0217	2.7
21	0840	40	80	inoperative	139	12.8	1.0217	1.5
22	0810	75	10	inoperative	9	13.3	1.0220	0.9
23	0839	80		inoperative	9	14.4	1.0226	0.9
24	0850	none	visible	inoperative	0	15.0	1.0234	1.2
25	0844	140		inoperative	12	14.4	1.0234	1.8
26	0840	110		inoperative	12	15.0	1.0238	5.5
27	0840	105	35	inoperative	139	15.0	1.0238	3.0
28	0847	90		inoperative	96	15.6	1.0240	2.4
29	0810	95	110	inoperative	104	16.1	1.0242	4.0
30	0855	45		50	242	13.3	1.0246	0.3

PART VI: WATER LEVELS

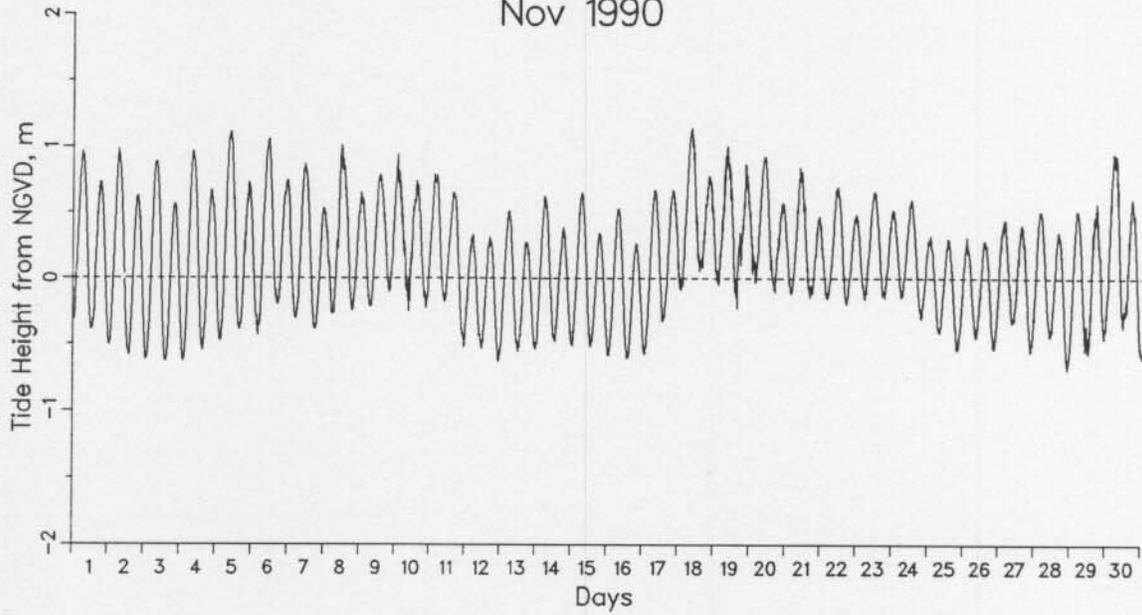
Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Nov 1990



Monthly Water Levels, m NGVD

Extreme Low = -0.69 on day 28 at 2106 EST
Extreme High = 1.14 on day 18 at 812 EST
Monthly Mean = 0.14
Mean Low = -0.39
Mean High = 0.65
Mean Range = 1.05

Table 6: Water Levels, m NGVD

		Nov 1990			
Mid-Cycle		Low	High	Mean	Range
Day	Time				
1	612	-0.39	0.97	0.31	1.36
1	1837	-0.50	0.73	0.12	1.23
2	703	-0.59	0.98	0.23	1.57
2	1928	-0.62	0.63	0.00	1.24
3	753	-0.63	0.89	0.16	1.52
3	2018	-0.63	0.57	-0.04	1.19
4	843	-0.55	0.97	0.23	1.51
4	2109	-0.47	0.67	0.07	1.14
5	934	-0.39	1.11	0.37	1.50
5	2159	-0.43	0.73	0.14	1.16
6	1024	-0.34	1.06	0.38	1.39
6	2249	-0.30	0.75	0.23	1.05
7	1115	-0.38	0.87	0.27	1.26
7	2340	-0.37	0.53	0.09	0.90
8	1205	-0.26	1.01	0.40	1.27
9	30	-0.23	0.65	0.20	0.89
9	1255	-0.21	0.80	0.35	1.01
10	121	-0.10	0.95	0.38	1.05
10	1346	-0.25	0.74	0.27	0.99
11	211	-0.23	0.79	0.30	1.02
11	1436	-0.43	0.65	0.20	1.08
12	301	-0.52	0.33	-0.09	0.85
12	1527	-0.61	0.31	-0.14	0.92
13	352	-0.63	0.51	-0.02	1.14
13	1617	-0.55	0.28	-0.15	0.84
14	442	-0.54	0.63	0.07	1.16
14	1707	-0.50	0.39	-0.08	0.89
15	532	-0.52	0.65	0.09	1.17
15	1758	-0.59	0.35	-0.12	0.93
16	623	-0.60	0.53	-0.01	1.13
16	1848	-0.60	0.27	-0.19	0.87
17	713	-0.52	0.68	0.13	1.20
17	1938	-0.29	0.67	0.23	0.96
18	804	-0.05	1.14	0.58	1.19
18	2029	-0.05	0.78	0.38	0.83
19	854	-0.23	1.01	0.44	1.23
19	2119	-0.03	0.87	0.37	0.90
20	944	-0.09	0.93	0.43	1.01
20	2210	-0.12	0.57	0.23	0.69
21	1035	-0.15	0.85	0.34	0.99
21	2300	-0.15	0.48	0.12	0.63
22	1125	-0.20	0.69	0.26	0.89
22	2350	-0.16	0.48	0.16	0.64
23	1216	-0.15	0.66	0.27	0.80
24	41	-0.14	0.52	0.19	0.66
24	1306	-0.30	0.60	0.17	0.90
25	131	-0.41	0.32	-0.03	0.73
25	1356	-0.55	0.30	-0.10	0.85
26	222	-0.45	0.31	-0.10	0.76
26	1447	-0.54	0.28	-0.10	0.82
27	312	-0.44	0.45	0.03	0.89
27	1537	-0.56	0.41	-0.04	0.97
28	402	-0.47	0.51	0.04	0.98
28	1628	-0.69	0.36	-0.13	1.05
29	453	-0.60	0.52	-0.02	1.12
29	1718	-0.57	0.57	-0.01	1.14
30	543	-0.37	0.95	0.32	1.33
30	1808	-0.61	0.60	0.02	1.21

PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in October and the only survey done in November on profile line 188, located 517 m south of the pier. There are only minor changes to the profile.

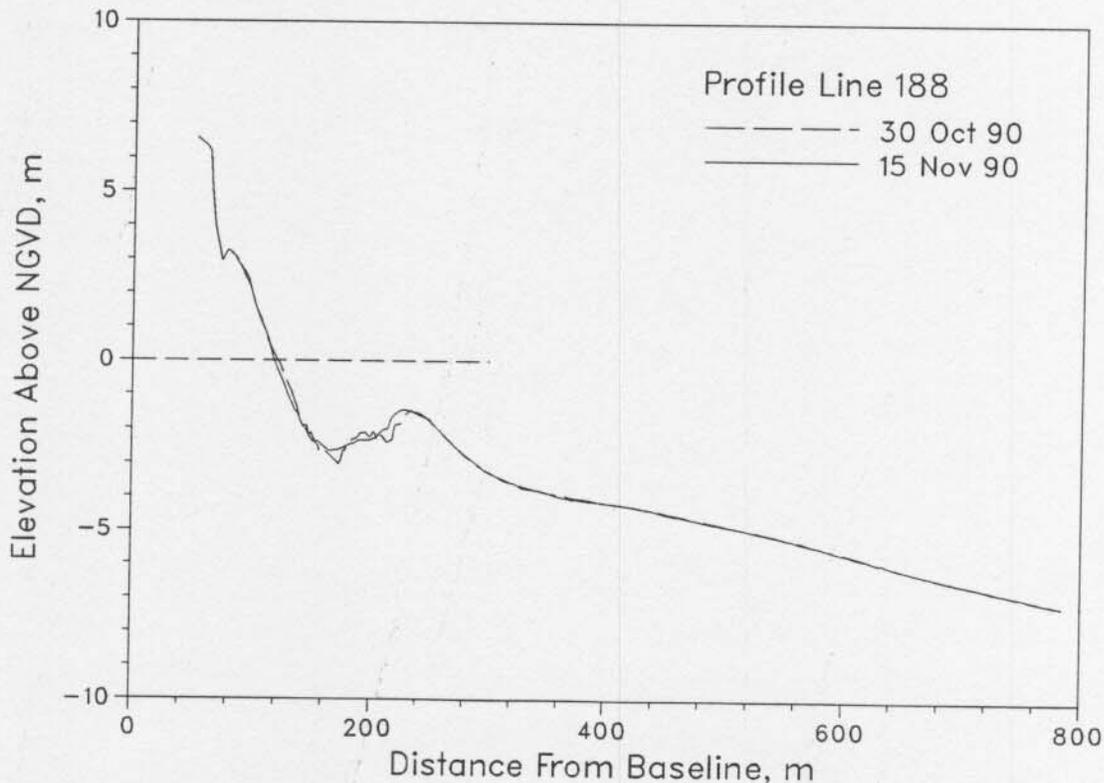


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1989.

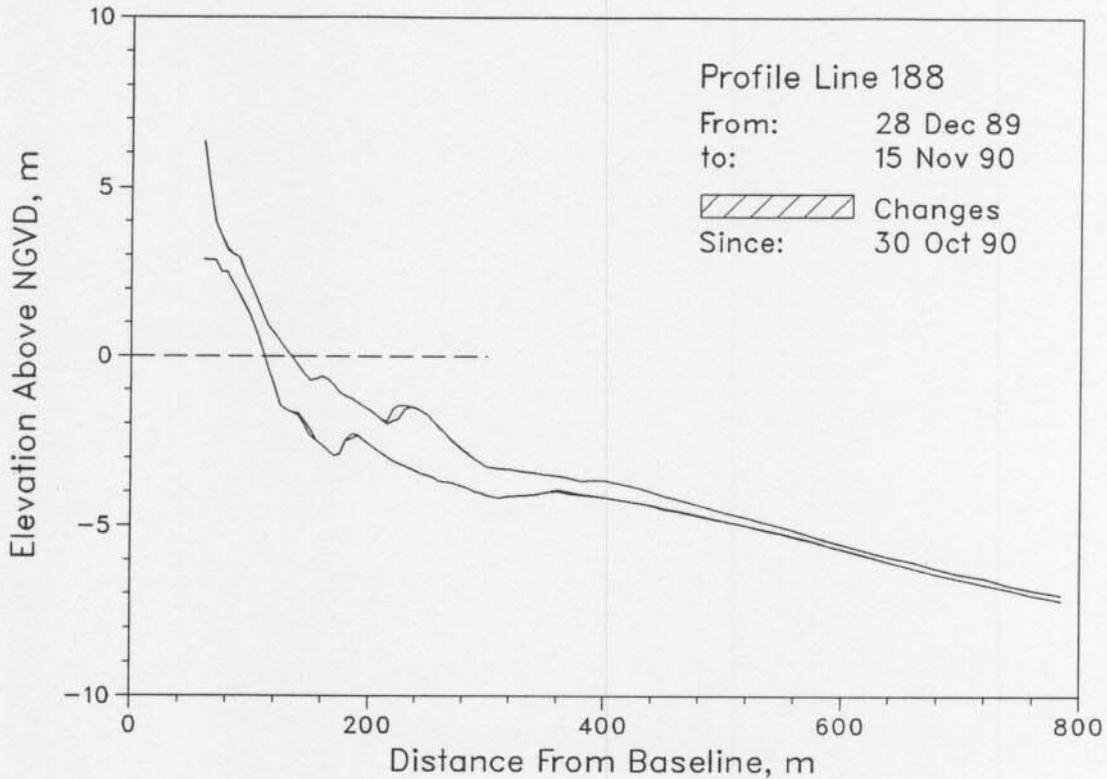


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 31 October. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition. There was no bathymetric survey during November, the October survey is included for reference.

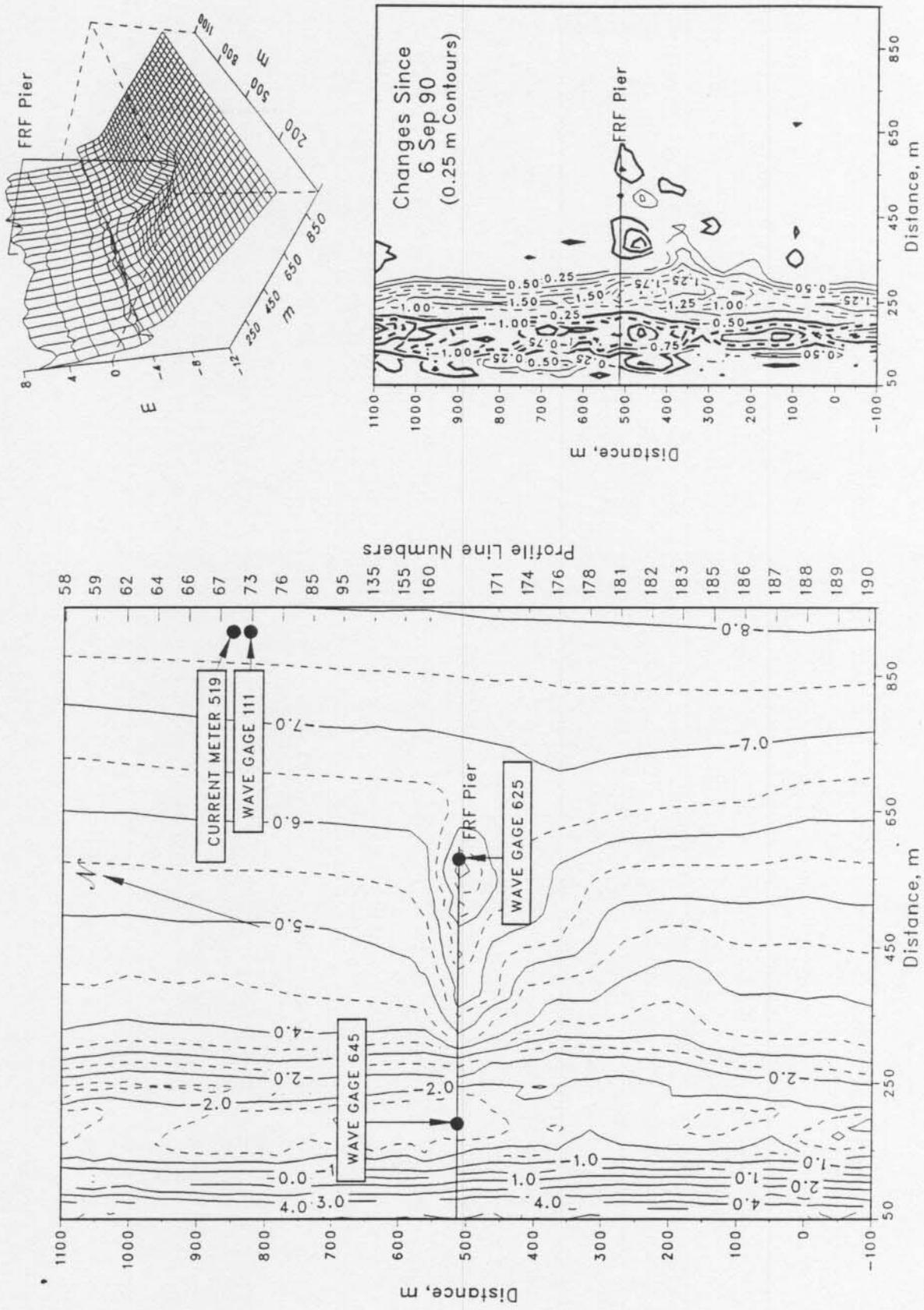


Figure 8. FRF bathymetry 31 Oct 90 depths relative to NGVD

PART VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the significant wave height at the seaward end of the pier (i.e. as measured near the end of the pier) exceeded 2 m and four contiguous 34 minute wave records were obtained every three hours:

<u>Start</u>	<u>End</u>
10 Nov (0451)	10 Nov (1034)
17 Nov (2200)	19 Nov (1634)
30 Nov (0100)	30 Nov (0316)

B. Storm Synopsis.

23 November - Developing over Texas early on 8 November this storm quickly moved to the east, being located over North Carolina on 10 November. Maximum wind speeds (from southeast) exceeded 13 m/s at 0508 EST on 10 November. The peak H_{mo} (at gage 625) reached 2.62 m ($T_p = 9.85$ sec) several hours later at 0734 EST. The minimum atmospheric pressure of 996.6 mb occurred at 0633 EST, also on 10 November. Total precipitation was 34 mm.

17-19 November - Strong winds generated by a mid-western high pressure system began to produce storm waves at the FRF late on 17 November. Maximum wind speeds (from north) exceeded 16 m/s at 2308 EST on 17 November. The peak H_{mo} (at gage 625) reached 2.37 m ($T_p = 7.76$ sec) at 0134 EST on 18 November.

30 November - Following the passage of a cold front early on 29 November strong winds generated by another mid-western high pressure system briefly produced storm waves at the FRF. Winds exceeded 10 m/s (from north-northwest) at 0100 EST on 30 November with the maximum H_{mo} (at gage 625) of 2.15 m ($T_p = 6.92$ sec) occurring at the same time.

Distribution List

Government Agencies:

OCE	U.S. Geological Survey
BERH	U.S. National Park Service
NAO	U.S. Naval Academy
NASA/Wallops Flight Center	U.S. Naval Civil Eng. Lab
NOAA (NOS, NWS)	U.S. Naval Fac. Eng. Com.
SAD	U.S. Naval Oceanographic Off.
SAW	U.S. Naval Research Lab

Colleges/Universities:

California Inst. of Tech.	Stockton State College
East Carolina University	University of Akron
Florida Inst. of Tech.	University of Delaware
Harvard University	University of Florida
Naval Post Graduate School	University of Maryland
NC State University	University of Miami
Old Dominion University	University of North Carolina
Oregon State University	University of N. Colorado
Prince George's College	University of Rhode Island
Rutgers University	University of Virginia
Scripps Inst. of Oceanography	Va. Inst. of Marine Science
Southern Illinois University	

Others:

City of Va. Beach, VA	MEC Systems Corporation
Coastal Barge Corporation	Moffatt & Nichol, Eng.
Coastal and Est. Res., Inc.	Offshore Coastal Technologies
Coastal Science & Eng., Inc.	Mr. Rowland
Dr. Galvin	Mr. Savage
GEOMET Tech., Inc.	Sea Port Supply Corp.
Greenhorne & O'Mara, Inc.	Shell Development
Dr. Hylton	Sherwood Industries
Mary Marr, Inc.	Mr. & Mrs. Valpey
Mr. Mason	WCTI-TV
Masonite Corporation	SEASUN Power Systems

Foreign:

W. F. Baird & Asso. Coastal Engineers, Ltd (Canada)
Queen's University, Ontario (Canada)
Ministry of Construction, Coastal Division (Japan)
Norwegian Hydrodynamic Laboratories (Norway)
University of New South Wales (Australia)
University of Sydney (Australia)